

Thalassorama

Managing longline fishing in Hawaii—practical aspects of regulatory economics

Theoretical economists tend to focus on highly mathematical models, and even applied academic economists tend to emphasize abstract principles of efficiency criteria for decision-making. Yet in the trenches of regulatory economics such niceties tend to be overwhelmed by limited information, inadequate data, simplistic models, and too little time. (We discount the possibility of inadequate analysts!) This note provides a brief review of such a situation in which the author played an active role.

In April 1991 an emergency moratorium¹ restricting new entry into the rapidly growing domestic longline fishery in Hawaii was implemented under the U.S. Magnuson Fishery Conservation and Management Act of 1976 (MFCMA). The emergency regulations were followed by a three-year moratorium on new entry which continues through April 1994, at which point it is either replaced by a formal limited entry program or lapses into open access.

The 1991 emergency moratorium and three-year moratorium contained two main measures: 1) a restriction on new entry into the Hawaii-based domestic longline fishery, and 2) restricted transferability of newly instituted longline permits. The Council identified two central reasons for the moratorium: 1) interaction between the growing longline fleet and the mixed domestic fleet of small commercial, charter, subsistence and recreational trollers and handliners which operate in the near-shore waters of Hawaii, and 2) the potential biological impact of the growing longline fleet on some pelagic species, particularly on North Pacific swordfish and Pacific-wide blue marlin. The first reason lay at the heart of the political pressure prompting the moratorium: physical gear conflicts between the two fleets and the perception by the small boat fleet of interception of their catch by longliners.² The second reason represented a conservative, conservationist approach to resource management recommended by the Council's scientific advisers. Because there was essentially no information on the dynamics of swordfish in this fishery, the recent and reputedly negative experience of the Atlantic swordfish fishery weighed heavily on the plan monitoring team (Berkeley, 1989).

The moratorium was proposed in a heated political climate where the number of active longline fishing vessels in Hawaii had increased from 35 in 1987 to 135 in 1990 and where longline landings of tuna and related species (excluding swordfish)

¹ Approved by the Western Pacific Regional Fishery Management Council (Council) in December 1990 and implemented through federal regulations by the National Marine Fisheries Service (NMFS) four months later.

² There was also a parallel regulation under consideration proposing closure of some main Hawaiian Island waters to longline fishing. This in fact occurred in June, 1991.

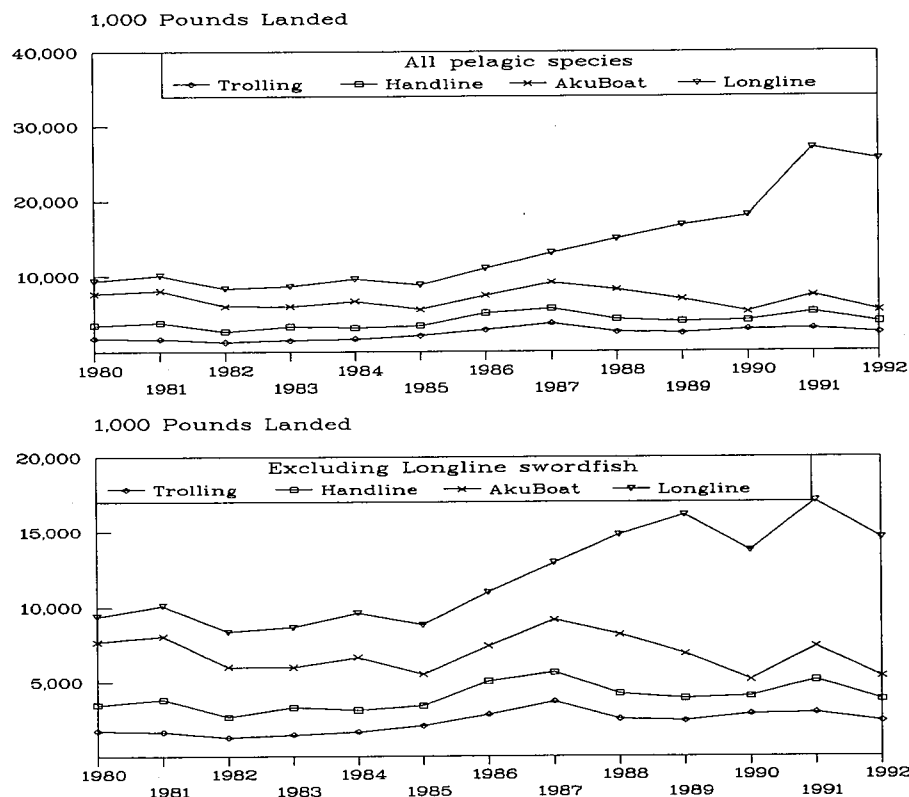


Figure 1. Hawaii's pelagic fishery, 1980-92 by gear type.

had increased from 1,700 t to 3,900 t in the same period (Figure 1a and 1b).³ At the same time, landings of many pelagic species by the troll and handline fleet had recently declined, with yellowfin tuna (their primary target species) declining from 1,950 t in 1987 to 900 t in 1990 (Ito, 1992).

The regulatory impact review (RIR)⁴ for the three-year moratorium (Pooley, 1991)⁵ provided a qualitative evaluation of the Council's management alternatives.⁶ The Council's preferred option was a complete moratorium on new entry. Two alternatives were the "no action" alternative (*i.e.*, open access), and a partial moratorium which would allow new entry beyond the 200-mile EEZ.⁷ Table 1 identifies the range of fishery components which might have been affected by the moratorium. Table 2 lists the types of impacts evaluated and Table 3

³ The growth of the fishery is documented in several reports prepared by NMFS, including Dollar (1992) and Ito (1992).

⁴ A regulatory impact review is mandated by Executive Order 12291 (1981) requiring a cost-benefit assessment of potential Federal regulations. It distills the economic analysis which is conducted during the regulatory decision-making process.

⁵ The RIR also considered two "separable" issues: Transferability of permits, and native Hawaiian and traditional fishing rights and practices. These are not discussed in this note.

⁶ Because of limitations on information available concerning the potential physical effects of the proposed action (and its alternatives) on fishing vessel performance and shoreside operations, a defensible quantitative approach was not considered to be possible.

⁷ This alternative was rejected by the Council because of enforceability concerns.

Table 1
Types of Fishing Vessels Potentially Affected by the Longline Moratorium

(Number in parenthesis is a *rough estimate* of the number of vessels in each category.)

1. Included Hawaii longline fishing vessels (140)
2. Excluded Hawaii longline fishing vessels (30)
3. Hawaii trollers and handline fishing vessels, full-time equivalent number (475 commercial, of which 75 are full-time charter boats, and 200 frequently active recreational fishers)
4. Excluded Hawaii fishing vessels (e.g., small-scale vessels which might have outfitted for short-set longliners, bottomfish, lobster, and albacore fishing vessels which might have outfitted for longline fishing) (25)
5. Excluded U.S. mainland longline fishing vessels (50)
6. Excluded U.S. mainland non-longline fishing vessels (number unknown)
7. Potential fishing vessels (i.e., those subject to investment) (number unknown)

(Pooley, 1991.)

presents the qualitative summary of impacts. The derivation of these impacts is the heart of the story.

The RIR was constructed by developing hypothetical operating relationships for affected fishing vessels and shoreside businesses (e.g., cost-earnings-operating relationships for longline and troll-handline boats) and testing the sensitivity of the results (e.g., total income and net revenue) to changes in operating parameters. Results were presented as ordinal measures (multiple *pluses* and *minuses*). Figure 2 outlines this procedure. The results were viewed as merely indicative of the range of potential effects because information on the possible relationship between the regulatory alternatives and components of the fishery was extremely limited. This was true both in terms of the effect of the regulation

Table 2
Types of Impacts Longline Moratorium Alternatives

1. Loss of total income for excluded Hawaii longline fishing vessels
2. Improvement in the trend of catch per unit effort for both
3. Improvement in the trend of average size of fish caught by either fleet
4. Increases in the distance traveled by longliners allowed to fish only outside the EEZ
5. Improvements in dockside queuing by longline vessels waiting to unload or to be serviced
6. Reduced gear conflicts in near-shore waters
7. Improvements in market prices
8. Reductions in total market revenue and reduced value—added to Hawaii seafood dealers
9. Reductions in the volume of shoreside provisioning
10. Reduced risk of over-fishing

(derived from Pooley, 1991.)

Table 3
Relative Fleet Impacts Longline Moratorium Alternatives

Impacts scaled from [- - - -] for relatively substantial costs to [0] for no apparent impacts to [+ + + +] for relatively positive benefits, evaluated for each type of fishing vessel, seafood markets, and shoreside infrastructure. Costs and benefits figured in *total* income, i.e., the sum of labor income and net revenue (profit).

1. Included Hawaii longline fishing vessels	
—No moratorium	0
—Partial moratorium	0
—Complete moratorium	+ +
2. Excluded Hawaii longline fishing vessels	
—No moratorium	0
—Partial moratorium	-
—Complete moratorium	- -
3. Hawaii trollers and handline fishing vessels	
—No moratorium	0
—Partial or complete moratorium	
—Baseline effect	0
—1% effect	+
—1987 effect	+ +
—Complete moratorium	+ +
4. Excluded Hawaii non-longline fishing vessels	
—No moratorium	0
—Partial moratorium	-
—Complete moratorium	- - -
5. Excluded U.S. mainland longline fishing vessels	
—No moratorium	0
—Partial moratorium	-
—Complete moratorium	- - -
6. Excluded U.S. mainland non-longline fishing vessels	
—No moratorium	?
—Partial moratorium	?
—Complete moratorium	?
7. Potential fishing vessels	
—No moratorium	?
—Partial moratorium	?
—Complete moratorium	?
8. Hawaii seafood market	
—No moratorium	0
—Partial moratorium	0
—Complete moratorium	- - -
9. Hawaii shoreside provisioners and suppliers	
—No moratorium	0
—Partial moratorium	0
—Complete moratorium	- - -
10. U.S. mainland markets and infrastructure	
—No moratorium	?
—Partial moratorium	?
—Complete moratorium	?

(Pooley, 1991.)

on vessel participation and fishing patterns and of the effect of these changes in participation on net revenues and total incomes in the various components of the fishery.

The following provides some brief examples of the application of this proce-

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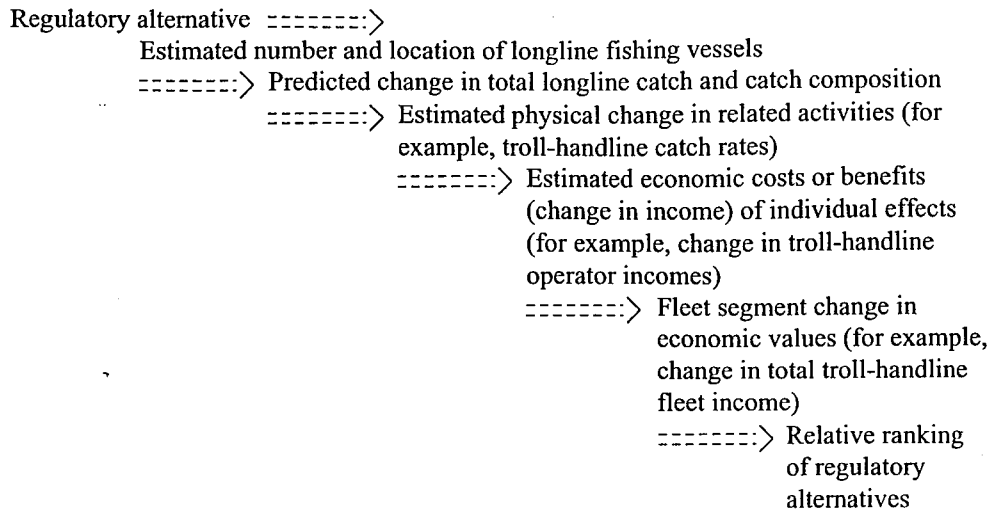


Figure 2. Causal Relationships in the Regulatory Impact Review

due to the evaluation of four of the potential effects: the opportunity losses of the excluded longline vessels, the potential catch and market competition effects between the two fleets, and the impact of the moratorium on shoreside provisioning.

Loss of Income for Excluded Fishing Vessels

The basic idea for evaluating this effect was that exclusion of any longline vessels represented a reduction in their operating choices as demonstrated by their [revealed] preference expressed for entry into the Hawaii longline fishery (Figure 3). Although they might operate in other fisheries, and nothing was known about the relative economic returns for the choice between fisheries, the moratorium would represent an opportunity cost to the excluded vessels. This cost was "measured" by estimating the transitional costs which the excluded vessels would have to bear in order to return to other locations or refit their vessels to other fisheries. These were estimated using a cost-earnings statement for a prototypical *lobster* boat (for which quite a lot was known), modifying the operational characteristics to reflect longline fishing, and estimating the administrative and logistical costs of transfer back to mainland U.S. fisheries. These were judged to include the administrative and logistical costs of transfer back to mainland U.S. fisheries (\$49,600), travel costs of \$2,000 based on transit to the west coast, and opportunity costs of \$26,000 based on lost fishing time. Such costs are frequently incurred by a number of

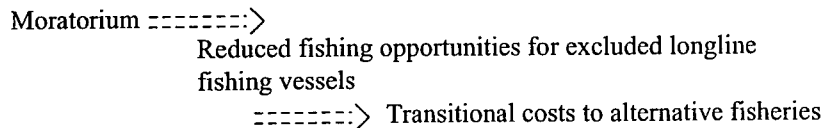


Figure 3. Loss of income longline vessels excluded from fishing in Hawaii by the moratorium

vessels in the Hawaii lobster fishery as those vessels often move between Hawaii and west coast fisheries but would represent real one-time losses to the excluded longline vessels as a result of the moratorium.

The RIR identified the lost income and additional expenses which would accrue to the excluded longline vessels. Typically in cost-benefit analysis, these would be weighed against the gains to the troll and handline sector to determine net national benefits. The catch and market competition sections of the RIR (discussed below) are a qualitative attempt to make that weighting, but it was an implicit rather than explicit weighting.⁸

Catch Competition (Improvement in the Catch-Per-Unit Effort for the Troll-Handline Fishing Fleet)

No statistically valid relationship between catch rates and expanded fishing effort has been identified in the Hawaii fishery (Boggs, 1993), but this relationship may be shielded by natural variability in the pelagic fisheries and by the extremely short time-series of information available. The RIR evaluated the impact of the exclusion of longliners from the Hawaii pelagic fishery by estimating what their catch would have been and applying several parameters reflecting various levels of risk of catch competition (Figure 4). The RIR estimated this "reduction" in catch (compared to the open access alternative) at 18 percent. Applying this to a longliner catch to troll/handline catch-per-unit-effort relationship of 3/10 of 1 percent (extension of an informal analysis prepared by the author in 1991),⁹ the annual impact of the moratorium was estimated as a \$150 increase in gross rev-

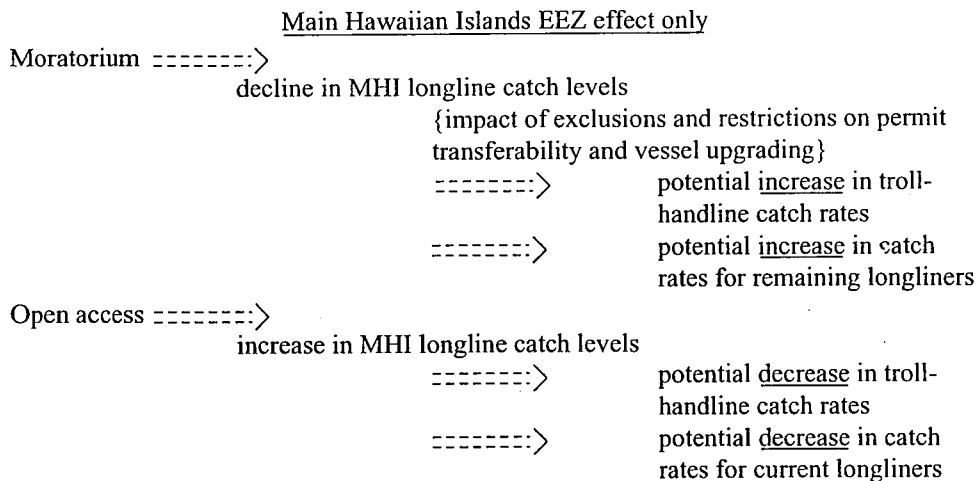


Figure 4. Catch competition (change in relative catch rates for longline and troll-handline fishing vessels)

⁸ Executive Order 12291 requires "Sec 3 (c) . . . agencies shall prepare Regulatory Impact Analyses of major rules . . . (d) . . . [which] shall contain the following information: (1) (2) (3) A determination of potential net benefits of the rule, including an evaluation of effects that cannot be quantified in monetary terms." (Reprinted in Smith, 1984, p. 241-246.)

⁹ This rate, 3/10 of 1%, is *statistically* insignificant but was used as a simulation possibility.

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enue and \$120 in total income per troll-handline vessel. The annual impact on charter boats was estimated as a \$96 increase in gross revenue and \$86 in total income per vessel.

Because these effects were so small, despite a) small-boat operators' beliefs that the effect has been much greater, and b) the actual decline in annual average troll-handline catch rates from 1987 to 1990, the RIR calculated two sensitivity tests for this effect: one based on a 1 percent relationship between the hypothesized decline in longline fishing effort and increased troll-handline catch rates and another based on the ratio of 1987 troll-handline catch rates to 1990 catch rates. The latter effect was rather substantial (11.1 percent) and the moratorium would then increase annual total income per troll-handline vessel by \$3,000.

From a cost-benefit and from a fisheries management perspective, this is a classic "allocation" issue, where explicit weighing of the alternative benefits to the two types of fleets was marginal at best. However, the fishery management councils are charged with weighing both, and the RIR should reflect not only executive Order 12291 dictates but the needs of the regional decision-makers as well.

Market Competition

The hypothesis was that increased landings of longline-caught fish have, and would, depress troll-handline prices for similar species (Figure 5). Pooley (1991) could not find a statistically valid relationship using recent data for yellowfin tuna (the primary target species), but evaluating troll-handline catch for all species combined, there was a small (although still statistically insignificant) effect: an 18 percent decrease in fishing effort and catch by the longline vessels excluded by the moratorium could increase market price by 1 percent for trollers and handliners.¹⁰

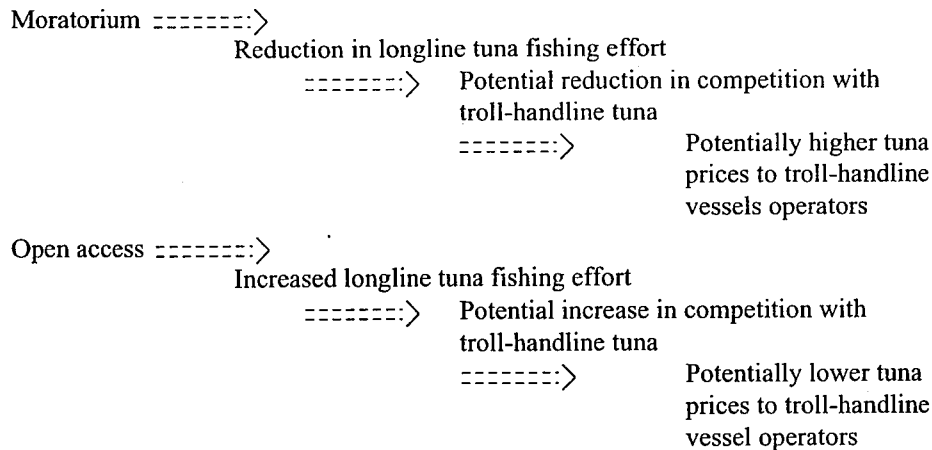


Figure 5. Market competition (Hawaii's market for fresh tuna)

¹⁰ Small-boat fishers in Hawaii are convinced that the longline fleet has had a substantially negative impact on their average prices. Although our data cannot reveal that impact, it is possible that a more refined analysis could untangle the relationship. Pooley (1987) found a clearer effect when analyzing Hawaii bottomfish catch and price. However it is also the

This amounted to \$95 in gross revenue per year per troll or handline vessel, a negligible quantity. The impact on consumers, in terms of reduced availability of fresh fish and higher prices, was unpredictable because a) retail markups are not known, and b) substantial volumes of the longline caught tuna were exported to markets where there is sufficient competition to make the Hawaii component marginal at most. Given the small effect, consumers are not likely to experience any substantial change in prices.

Someone used to estimating net national benefits under typical cost-benefit terms might ask, how could "market competition" be considered a *cost* in any sense? You of course would be correct, in a strictly net-benefits perspective. However, the seafood market serves two functions in Hawaii: it provides a means of product exchange and income valorization for commercial fishing operators, and it provides a means of offsetting subsistence and recreational fishing costs for "noncommercial" small-boat operators. Thus, "competition" from the longliner would reduce the nonmonetary advantages of subsistence fishing and reduce the opportunities for recreational fishing experiences. The RIR made no judgement on commercial vs. subsistence and recreational benefits, except to attempt to quantify them.

Impact on Shoreside Businesses

The RIR estimated that a complete moratorium would reduce total market revenue and income to Hawaii seafood dealers by \$15.4 million (independent of price effects) based on the loss of landings from the excluded vessels (Figure 6). The loss to the seafood dealers would be \$3.8 million in value-added, based purely hypothetically on a 25% value-added on total ex-vessel longline revenue. Similar losses would accrue to firms supplying equipment and supplies to the longline fleet, with no offsetting increase in troll-handline provisioning.

From a net national benefits perspective, these "losses" are national losses (or even regional or local losses) only if the Hawaii seafood firms have unemployed or underemployed labor and capital from which to draw. Otherwise they merely represent a shifting of resources from one use to another. Given the relative levels of unemployment in the United States and the lack of productive investment in general, reductions in shoreside business volume would seem to represent real losses to the national economy.

The other potential effects were evaluated in a similar manner, with similar problems in quantifying the relationships between the management alternatives and the various fleet and business components. Because of the weak statistical base on which these per-unit estimates were made, they were not summed to estimate the relative costs and benefits of the moratorium alternatives. Thus the RIR did not really estimate the efficiency gains or losses from the moratorium but instead concentrated on identifying the distribution of gains and losses, including their impact on secondary businesses (*e.g.*, the shoreside provisioning firms). Nonetheless, the RIR indicated that the greatest cost of the preferred alternative would be the opportunity losses of Hawaii longline vessels which were excluded

case that if an annual aggregate relationship cannot be found, then one week's price declines are probably another week's price increases (subject to Friedman's (1992) warning).

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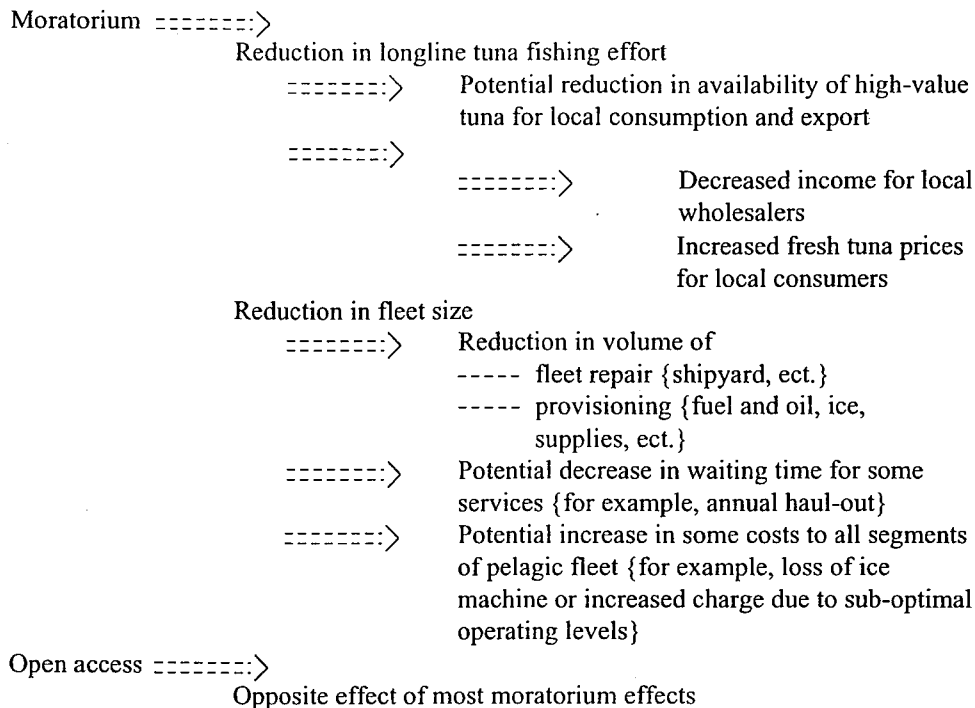


Figure 6. Hawaii shoreside business volume

from the fishery (some longliners had begun fishing or had begun investment to longline in Hawaii after a control date, June 1990, but before the first emergency moratorium was actually implemented in April 1991) and by Hawaii market and shoreside industries denied additional income by lost growth in the size of the longline fleet. Ironically, the largest benefit from the complete moratorium was expected to be improvements in logistics for the included longline vessels (*i.e.*, less crowding dockside).

While it could hardly be said that the RIR provided strong justification for the moratorium, in the context of a political compromise by the various parties to the Council decision-making process it did not identify catastrophic costs if the moratorium were implemented for up to three years (at which point NMFS said that a flexible limited entry plan would be required).

Evaluation of the moratorium alternatives is particularly difficult because neither the short-term nor long-term physical effects on changing levels of longline fishing on the pelagic species are known. This review attempts to pose meaningful scenarios of the possible effects with the view to posing the issues succinctly for the Council. Ultimately, however, it appears that the decision on the moratorium alternatives is likely to be a pragmatic one which is ultimately reversible after three years. (Pooley, 1991, p. 16).

It might also be useful to note that while the outline of the RIR was presented to the Council at the time of their decision on the three-year moratorium, almost no comments or questions were posed of its author. This was true throughout the

regulatory drafting process, which perhaps suggests that in fisheries management the weight of economic efficiency is quite limited.

The Council is now in the process of evaluating limited entry alternatives to replace the moratorium in 1994, but it is doing so without any substantive change in the amount of information available on which to evaluate the potential impacts of regulatory alternatives. The apparently viable alternatives at this stage are the "no action" alternative (*i.e.*, a return to open access), a long-term moratorium (with extremely limited access and permit transferability), and a more flexible permit transferability system with an adaptive approach to the number of permits (perhaps combined with some sort of "fractional licensing" system (Townsend, 1991; Townsend and Pooley, 1993)). This decision was planned for August 1993 for implementation in April 1994.

Sam Pooley
National Marine Fisheries Service
Honolulu Laboratory, Southwest Fisheries Science Center,
Honolulu, Hawaii 96822-2396

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